Dec. 19, 1939. J. G. GRAHAM 2,183,793

ROCK DRILLING MECHANISM

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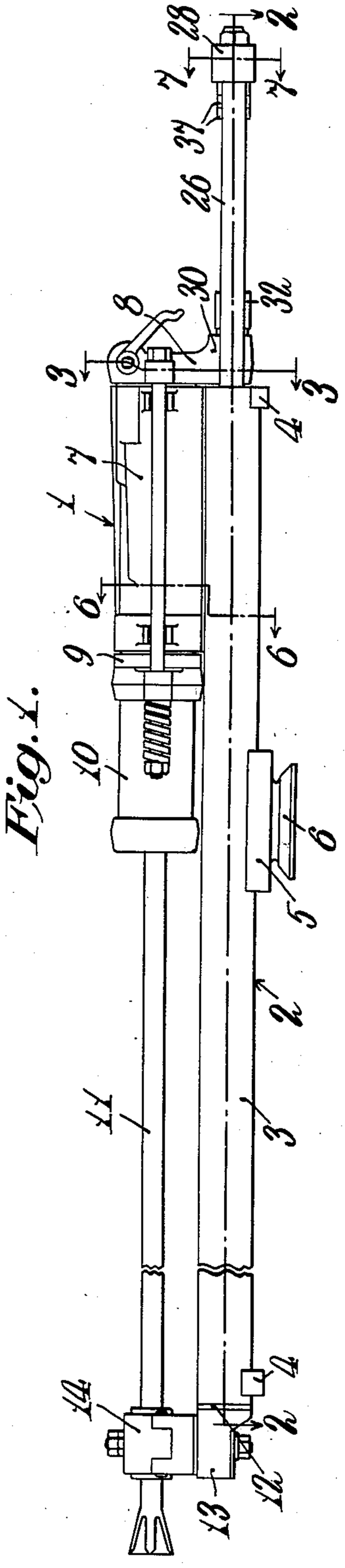

Fig. 1.

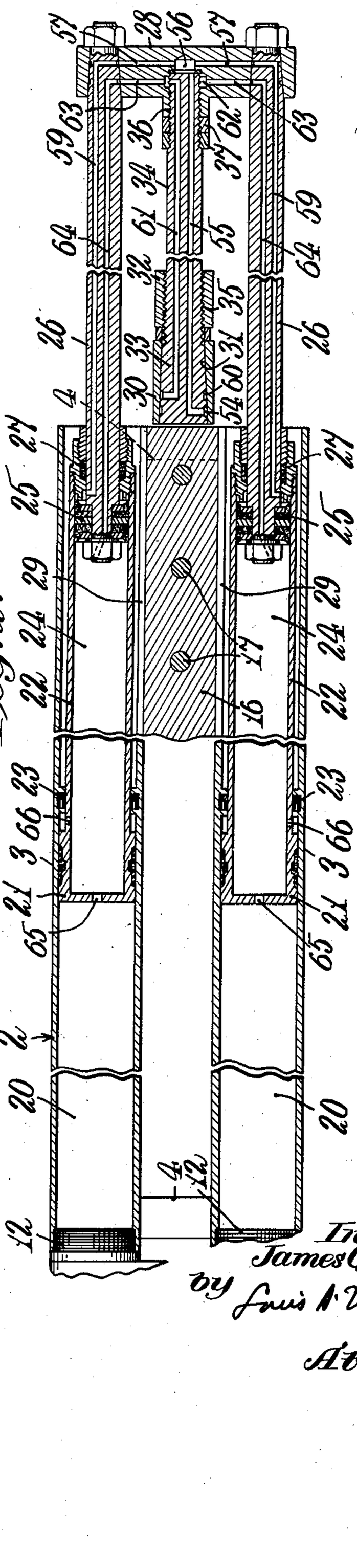

Fig. 2.

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Fig. 3.

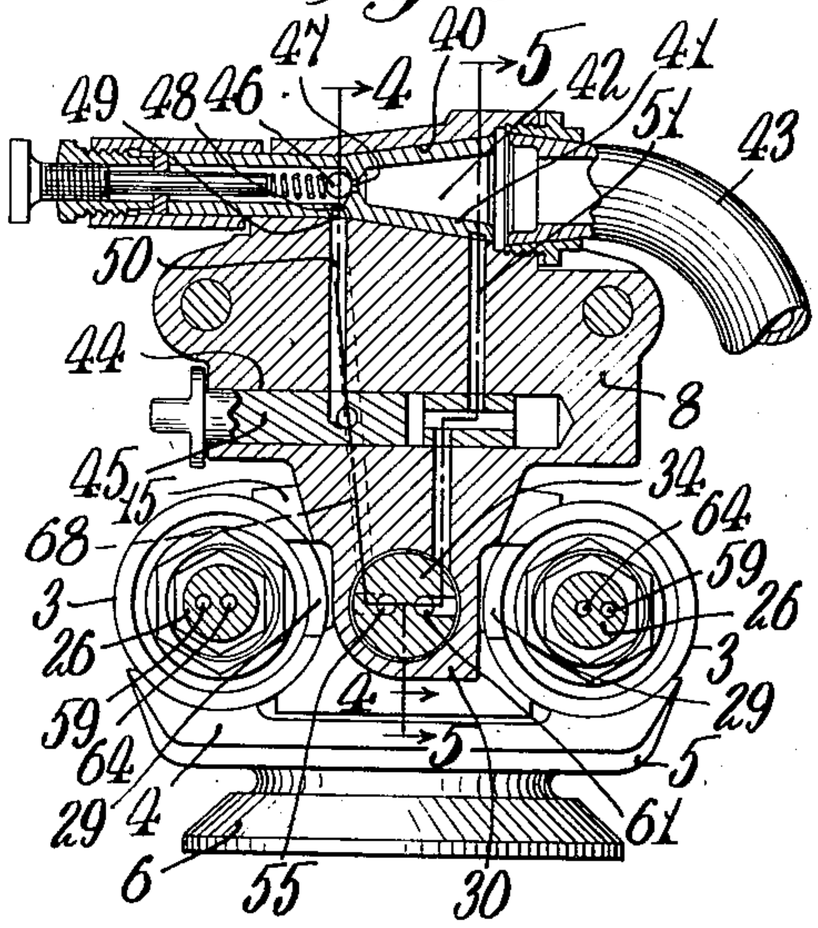


Fig. 4.

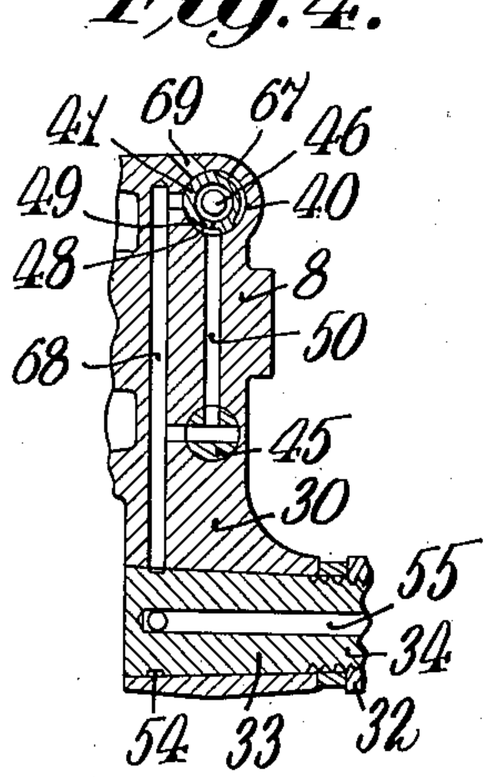


Fig. 5.

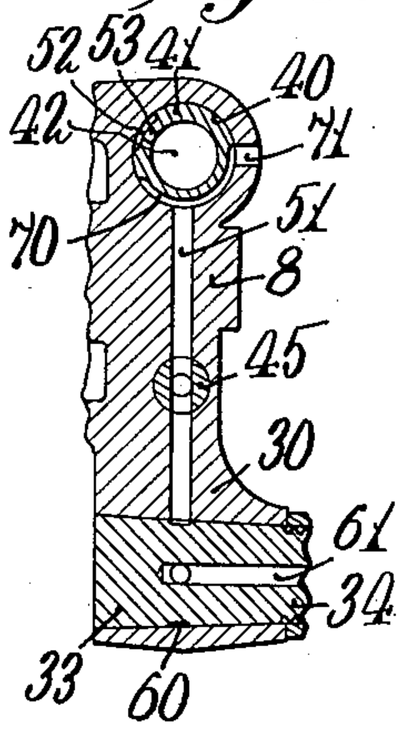


Fig. 6.

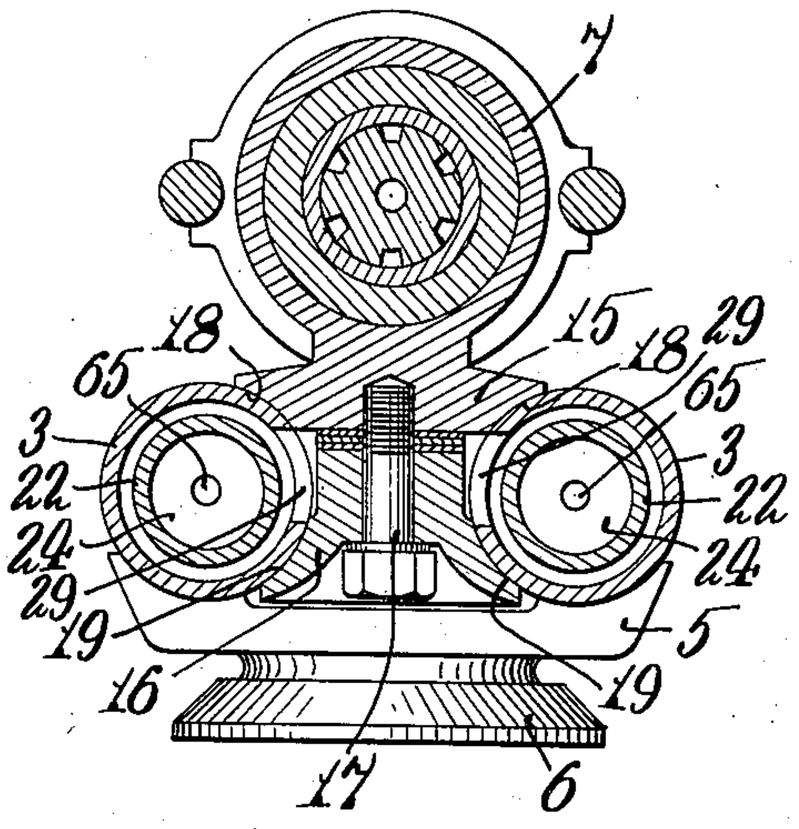
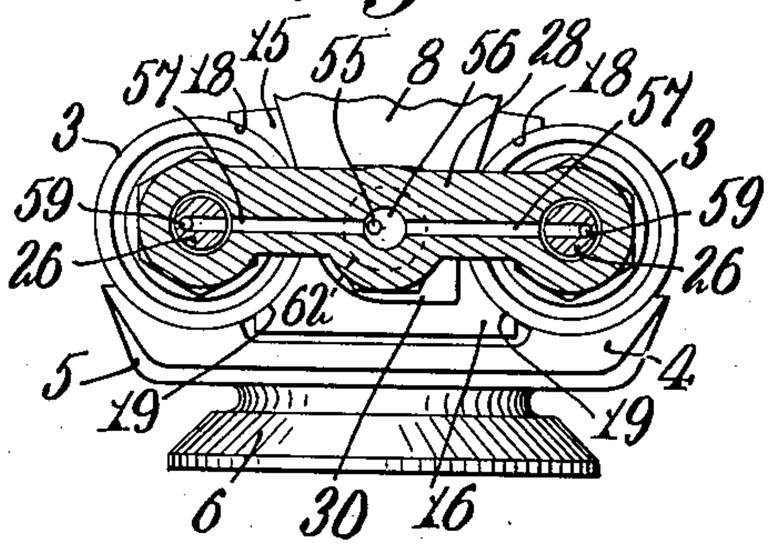


Fig. 7.



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Patented Dec. 19, 1939 2,183,793

UNITED STATES PATENT OFFICE

2,183,793

ROCK DRILLING MECHANISM

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Application August 6, 1936, Serial No. 94,501

3 Claims. (Cl. 121—9)

This invention relates to rock drilling mechanisms, and more particularly to improved feeding and guiding means for a hammer rock drill of the mounted type.

An object of this invention is to provide an improved feeding and guiding means for a rock drill of the mounted type. Another object is to provide an improved pneumatically fed rock drill of the mounted type wherein, when the feeding mechanism is fully extended, the overall dimensions of the feeding mechanism are maintained at a minimum. Yet another object is to provide an improved rock drill feeding mechanism whereby, with a relatively compact mechanism, a relatively long feeding travel for the drill is attained. A further object is to provide an improved rock drilling mechanism having improved feeding and guiding means whereby the rock drill is fed and guided in an improved manner. A still further object of this invention is to provide an improved rock drill feeding mechanism of the multi-cylinder type wherein telescopically arranged cylinder elements are employed for effecting feeding of the drill. Still another object of this invention is to provide an improved pneumatic feeding means for a rock drill embodying parallel guide members along which the rock drill is slidably guided and having associated therewith telescopically arranged cylinder elements whereby the overall dimensions of the feeding mechanism are reduced to a minimum. Other objects and advantages of the invention will, however, hereinafter more fully appear in the course of the following description and as more particularly pointed out in the appended claims.

In the accompanying drawings, there is shown for purposes of illustration one form which the invention may assume in practice.

In these drawings:

Fig. 1 is a side elevational view of the illustrative embodiment of the improved rock drill feeding and guiding means.

Fig. 2 is an enlarged horizontal sectional view taken substantially on line 2—2 of Fig. 1, showing the feeding mechanism in extended position.

Fig. 3 is an enlarged cross sectional view taken substantially on line 3—3 of Fig. 1.

Fig. 4 is a detail sectional view taken on line 4—4 of Fig. 3.

Fig. 5 is a detail sectional view taken on line 5—5 of Fig. 3.

Fig. 6 is an enlarged cross sectional view taken substantially on line 6—6 of Fig. 1.

Fig. 7 is an enlarged cross sectional view taken substantially on line 7—7 of Fig. 1.

In this illustrative embodiment of the invention, the rock drill is generally designated 1 and the improved feeding and guiding means is generally designated 2. The drill guiding means comprises a pair of tubular guiding members 3, 3 of elongated cylindrical form arranged in parallel side by side relation and rigidly fixed together at their ends by transverse connecting portions 4, 4 secured, as by welding, to the lower portions of the tubular guides 3, and intermediate the ends of the guide members is a transverse frame 5 having an integral swivel plate or trunnion 6 adapted to be clamped in the saddle mounting of a conventional rock drill support. The rock drill 1 is of a conventional design comprising a pressure fluid actuated hammer motor having a motor cylinder 7 containing a usual reciprocable hammer piston and provided with a rear head block 8, a front head 9 and a front chuck housing 10, the latter supporting, in a usual manner, a chuck for receiving the shank of a rock drill steel 11. As the particular construction of the rock drill does not per se enter into this invention, illustration and description thereof are not considered necessary.

As illustrated, the forward ends of the parallel tubular guides 3, 3 are closed by heads 12, 12, suitably threaded within the bores of the guides, and these heads have an integral projection 13 on which is detachably mounted a guide or centralizer 14 for embracing the body of the drill steel 11 to guide the latter during the drilling operation. The rock drill 1, as illustrated herein, is supported directly on and between the parallel tubular guide members 3, 3 by the provision of a depending portion 15 which may be of suitable longitudinal length so as to provide sufficient bearing surface, and projecting between the guide members, while a cooperating guiding element 16 is removably secured to and spaced from the portion 15 as by screw bolts 17. The elements 15 and 16 present arcuate bearing surfaces 18 and 19 slidably engaging the adjacent sides of the outer peripheries of the tubular guide members 3, 3. It will thus be seen that the rock drill is entirely supported by and slidably guided directly on the parallel guide members on the exterior peripheries of the latter without the intermediation of any other guiding elements, thereby greatly simplifying the guiding structure for the drill.

Now referring to the improved feeding mechanism, it will be noted that formed within the forward portions of the tubular guide members 3, 3 are parallel feed cylinders 20, 20, stationary with

respect to the guide members, and each containing a reciprocable feed piston 21. The piston rods 22 of the feed pistons 21 extend rearwardly through the packed rear heads 23 of the feed cylinders 20 and have respectively formed therein feed cylinders 24, 24 alined with the feed cylinders 20, 20 and containing reciprocable feed pistons 25, 25 respectively. The piston rods 26 of the feed pistons 25 extend rearwardly through the packed rear heads 27 of the feed cylinders 24, 24. As shown in Fig. 2, the rear ends of the parallel feed piston rods 26, 26 are rigidly connected together by a transverse connecting frame 28 extending therebetween and adapted to enter and move within longitudinal slots 29 formed along the inner sides of the tubular guide members, the slots 29 permitting movement of the transverse connecting frame 28 with respect to the tubular guide members as the feed pistons move forwardly. The rear head 8 of the rock drill is formed with a depending boss or lug 30, having a conical bore 31 in which is secured, as by a nut 32, the conical front end 33 of a connecting rod 34, the nut 32 being threaded, at 35, on this connecting rod and engaging the rear surface of the rear head boss 30 in the manner shown in Fig. 2. This connecting rod extends rearwardly longitudinally in parallelism with and between the piston rods 26, 26 and is threadedly secured at its rear end at 36 within the transverse connecting frame 28 and is held therein by lock nuts 37 threaded on the connecting rod and engaging the forward surface on the connecting frame. It will thus be seen that, as the feed pistons are reciprocated within their respective cylinders with respect to the parallel guide members, the rock drill 1 is fed along its guiding surfaces on the exterior peripheries of the parallel guide members 3, 3.

Now referring to the means for supplying pressure fluid to the feeding cylinders and the rock drill, it will be noted that arranged in a transverse bore 40 formed in the rear head block 8 of the rock drill 1 is a rotary control valve 41 having an internal pressure chamber 42 to which pressure fluid is supplied through a pipe connection 43 from any suitable source of supply. Arranged in a bore 44 parallel with the valve bore 40 is a rotary fed control valve 45. Herein mounted within the control valve 41 is a valve means 46 for regulating the feeding pressure. The rotary valves 41 and 45 and the regulating valve means 46 are generally similar to those described in Patent No. 2,015,678 granted October 1, 1935 to M. C. Huffman, and, as the specific structure of these valve means are clearly described in that patent, a description thereof herein is considered unnecessary, other than to state that the feeding pressure reducing valve 46 may be adjusted to regulate the feeding pressure, and the feed control valve 45 may be operated to control the flow of feeding pressure to the feeding cylinders to effect reversal in the direction of feed irrespective of the feeding position of the control valve 41; and the control valve 41 may be operated to control the supply of pressure fluid to the hammer motor of the rock drill and to the feeding cylinders. Pressure fluid is adapted to flow from the pressure chamber 42 in the control valve 41, through an axial passage 47 (see Fig. 3) under the control of the feeding pressure reducing valve 46, to a passage 48 in the valve 41 communicating with a circumferential groove 49 (see Fig. 4), the latter in turn communicating with a forward feed supply passage 50. A reverse feed supply passage 51 is communicable through a circumferential groove 52 on the valve 41 (see Fig. 5), in turn communicating through a passage 53 in the valve 41, with the pressure chamber 42. The forward feed passage 50 is communicable through passages in the control valve 45 with an annular groove 54 on the forward portion of the connecting rod 34, in turn communicating, through a passage 55 in the connecting rod 34, with a recess 56 in the connecting frame at the rear end of the connecting rod. This recess is connected by transverse passages 57, 57, in the connecting frame 28, with passages 59, 59 formed in the piston rods 26, 26 with the rear ends of the bores of the feed cylinders 24, 24 at the rear sides of the pistons 25. The reverse feed passage 51 is communicable, through passages in the control valve 45, with an annular groove 60 on the forward portion of the connecting rod 34, in turn communicating, through a passage 61 in the connecting rod, with an annular groove 62 in the connecting frame 28 and surrounding the rearward portion of the connecting rod. The groove 62 is connected by passages 63, 63, formed in the connecting frame 28, with passages 64, 64 formed within the piston rods 26, 26. These passages 64, 64 extend forwardly through the forward ends of the piston rods and communicate with the bores of the feed cylinders 24, 24 at the forward sides of the feed pistons 25. The forward ends of the bores of the feed cylinders 24, 24 are connected through axial passages 65, 65 in the forward heads of the feed cylinders 24, 24, while radial passages 66, 66 in the walls of the piston rods 22, 22 connect the bores of the cylinders 24 with the bores of the cylinders 20 at the rear sides of the feed pistons 21. The control valve 41 has a circumferential groove 67 (see Fig. 4), for connecting, through a passage 68, the passage 55, when the throttle valve is turned into the position opposite from that shown in Fig. 4, with an exhaust passage 69, while the reverse feed passage 51 is communicable through a circumferential groove 70 (see Fig. 5), on the control valve 41, with an exhaust passage 71. The throttle valve, as described in the above mentioned patent, has a passage for supplying pressure fluid from the pressure chamber 42 in the valve to the supply passage of the hammer motor of the rock drill for operating the latter in the manner well understood by those skilled in the art.

The mode of operation of the rock drilling mechanism above described will be clearly apparent from the description given. When the valves are in the position shown in Figs. 4 and 5, pressure fluid may flow from the pressure chamber 42, in the control valve 41, through axial passage 47, past the feeding pressure regulating valve 46 and through passage 48, groove 49, forward feed passage 50, groove 54, passage 55 in the connecting rod, recess 56, passages 57 in the connecting frame and passages 59 in the piston rods 26 to the rear ends of the bores of the feed cylinders 24 at the rear sides of the feed pistons 25. At the same time, the opposite ends of the bores of the cylinders 24 and the bores of the cylinders 20 are connected to exhaust through the passages 64 in the piston rods 26, passages 63 in the connecting frame, groove 62, passage 61 in the connecting rod, groove 60, passage 51 and the exhaust passage 71. The pressure fluid in the bores of the feed cylinders 24 acts on the rear pressure areas of the feed pistons 25 to move the latter forwardly within the bores of the feed cylinders 24, and, when the rear edges of the feed

pistons 25 overrun the ports 66 in the piston rods 22, pressure fluid is also admitted from the bores of feed cylinders 24 to the rear ends of the bores of the feed cylinders 20 at the rear sides of the feed pistons 21, the pressure in the bores of the feed cylinders 20 acting on the rear pressure areas of the feed pistons 21 to move the latter forwardly relative to the feed cylinders 20, 20, the feed cylinders 24 and feed pistons 25 moving forwardly with the feed pistons 21 at that time. As a result, the rock drill 1 is fed forwardly along the guiding members 3, 3. When it is desired to effect reverse feed of the rock drill along its guideways relative to the parallel guide members, the throttle valve 41 is turned into the position opposite from that shown in Figs. 4 and 5, so that the groove 52 connects the reverse feed passage 51 with the passage 53 communicating with the pressure chamber 42 in the control valve 41, and the passage 68 is connected by the groove 67 with the exhaust passage 69. When the throttle valve is in this position, pressure fluid may flow from the pressure chamber 42, through passage 53, groove 52, reverse feed pasage 51, groove 60, passage 61 in the connecting rod 34, groove 62, passages 63 and passages 64 in the piston rods 26 to the forward ends of the bores of the feed cylinders 24 at the forward sides of the feed pistons 25. Pressure fluid flows at this time from the bores of the feed cylinders 24 through the axial passages 65 to the bores of the feed cylinders 20 at the forward sides of the feed pistons 21. Simultaneously, the rear ends of the bores of the feed cylinders 24 at the rear sides of the feed pistons 25 are connected to exhaust through the passages 59 in the piston rods, passages 57, recess 56, passage 55 in the connecting rods 34, groove 54, the passage 68, groove 67 on the control valve 41 and exhaust passage 69. The pressure fluid flowing to the forward ends of the bores of feed cylinders acts on the forward pressure areas of the pistons 21 and 25 to move the latter rearwardly with respect to the guide members 3, 3, moving therewith the cylinders 24, and, as a result, the rock drill 1 is fed rearwardly along the guiding surfaces of the tubular guiding members. It will be evident that the forward feeding pressure may be regulated by the reducing valve 46, and the feeding pressure may be controlled at will and the feed reversed by the control valve 45 all in the manner described in the patent above referred to.

As a result of this invention, it will be noted that an improved rock drilling mechanism is provided having a novel feeding and guiding structure for the rock drill whereby the rock drill may be fed relative to the guiding means in an improved manner. It will further be noted that by the provision of the extremely compact arrangement of the feeding and guiding elements, it is possible, by the extremely compact structure, to obtain a relatively long range of drill feed. It will still further be noted that, by the particular double, telescopic feeding arrangement shown, it is possible to reduce the overall dimensions of the drilling mechanism when the feeding means is in its fully extended position, without reducing the feeding travel of the drill. Other uses and advantages of the improved rock drilling mechanism will be clearly apparent to those skilled in the art.

While there is in this aplication specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration, and that the invention may be further modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a rock drilling mechanism, in combination, guiding means comprising a pair of tubular guide members arranged in rigid parallel side by side relation, a rock drill guided on said guiding means for feeding movement longitudinally along said parallel guide members therebetween, and means for feeding said rock drill along said guiding means comprising stationary feed cylinders arranged in said guide members respectively, feed pistons reciprocable in unison within said feed cylinders and having parallel tubular piston rods arranged within said guide members, said tubular piston rods having parallel feed cylinders formed therein, feed pistons reciprocable in unison within said last mentioned feed cylinders and having parallel piston rods projecting outwardly from said guide members, a connecting rod parallel with said last mentioned piston rods and arranged longitudinally between said guide members, said connecting rod secured to the rock drill, and a transverse connection between the outer ends of said last mentioned piston rods and said connecting rod, said guide members slotted longitudinally along the adjacent inner sides thereof to receive said transverse connection, said slots permitting longitudinal movement of said transverse connection relative to said guide members as the rock drill is fed along said guiding means.

2. In a rock drilling mechanism, in combination, guiding means comprising a tubular guide cylinder having on its exterior periphery an arcuate drill guiding surface, a rock drill movable longitudinally along said guiding means and having an arcuate bearing surface slidably guided on said peripheral guiding surface of said guide cylinder, and means for feeding the rock drill longitudinally along said guiding means comprising a feed cylinder formed within a portion of said guide cylinder, a feed piston reciprocable in said feed cylinder and having a tubular piston rod arranged within said guide cylinder, said piston rod having a feed cylinder formed therein, a feed piston reciprocable in said last mentioned feed cylinder and having a piston rod, a connecting rod extending longitudinally along one side of said guide cylinder in parallelism with said last mentioned piston rod and secured to the rock drill, and a transverse connection between the outer ends of said last mentioned piston rod and said connecting rod, said guide cylinder being longitudinally slotted through a wall thereof to receive said transverse connection, said slot permitting longitudinal movement of said transverse connection relative to said guide cylinder as the rock drill moves longitudinally along the guiding means.

3. In a rock drilling mechanism, in combination, guiding means comprising a pair of tubular guide cylinders arranged in rigid parallel side by side relation and having on their exterior peripheries arcuate drill guiding surfaces, a rock drill movable longitudinally along said guiding means and having arcuate bearing surfaces slidably guided on said peripheral guiding surfaces of said guide cylinders, and means for feeding the rock drill longitudinally along said guiding means comprising parallel feed cylinders formed within portions of said guide cylinders, feed pistons re-

ciprocable in unison within said feed cylinders and having parallel tubular piston rods arranged within said guide cylinders, said piston rods having parallel feed cylinders formed therein, feed pistons reciprocable in unison within said last mentioned feed cylinders and having parallel piston rods, a connecting rod arranged longitudinally between said guide cylinders in parallelism with said last mentioned piston rods and secured to the rock drill, and a transverse connection between the outer ends of said last mentioned piston rods and said connecting rod, the inner adjacent sides of said guide cylinders being longitudinally slotted through the walls thereof to receive said transverse connection, said slots permitting longitudinal movement of said transverse connection relative to said guide cylinders as the rock drill moves longitudinally along said guiding means.

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